

**CLAIMS**

1. A radio-frequency (RF) repeater, comprising:

a first repeating section, which is adapted to receive and amplify forward-signals from a first transceiver so as to generate amplified-forward-signals and to radiate the amplified-forward-signals to a second transceiver, and to receive and amplify reverse-main-signals from the second transceiver so as to generate amplified-reverse-main-signals and to transmit the amplified-reverse-main-signals to the first transceiver; and

a second repeating section, which is adapted to receive and amplify reverse-diversity-signals from the second transceiver so as to generate amplified-reverse-diversity-signals and to transmit the amplified-reverse-diversity-signals to the first transceiver.

2. A repeater according to claim 1, and comprising a housing which contains the first and second repeating sections.

3. A repeater according to claim 1, wherein the forward-signals are not received by the second transceiver, and the reverse-main-signals and the reverse-diversity-signals are not received by the first transceiver.

4. A repeater according to claim 1, wherein the reverse-main-signals and the reverse-diversity-signals are generated from a reverse-signal transmitted from the second transceiver.

5. A repeater according to claim 1, wherein the first repeating section comprises a first antenna which receives the reverse-main-signals, and wherein the second repeating section comprises a second antenna which receives the reverse-diversity-signals.

6. A repeater according to claim 5, wherein the first and second antennas are separated by a distance within a range of 1 - 6 wavelengths of the reverse-main-signals and the reverse-diversity-signals.

7. A repeater according to claim 5, wherein the first and second antennas are adapted to receive differently polarized signals.

8. A repeater according to claim 1, wherein the first and the second repeating sections are adapted to introduce a time differential between the reverse-main-signals and the reverse-diversity-signals.

9. A radio-frequency (RF) repeater system, comprising:  
a first repeater unit, which is adapted to receive and amplify forward-signals from a first transceiver so as to generate amplified-forward-signals;

cabling, which is adapted to receive and convey the amplified-forward-signals from the first repeater unit; and

a second repeater unit, which is adapted to receive the amplified-forward-signals from the cabling and to further amplify the amplified-forward-signals so as to generate resultant-forward-signals and to radiate the resultant-forward-signals to a second transceiver, and which is adapted to receive and amplify reverse-main-signals and reverse-diversity-signals from the second transceiver so as to generate respectively amplified-reverse-main-signals and amplified-reverse-diversity-signals and to convey the amplified-reverse-main-signals and the amplified-reverse-diversity-signals to the first repeater unit via the cabling, and wherein the first repeater unit is adapted to further amplify the amplified-reverse-main-signals and amplified-reverse-diversity-signals so as to generate respective resultant-reverse-main-signals and resultant-reverse-diversity-signals and to transmit the resultant-reverse-main-signals and the resultant-reverse-diversity-signals to the first transceiver.

10. A repeater according to claim 9, wherein the forward-signals are not received

- 2 by the second transceiver, and the reverse-main-signals and the reverse-diversity-signals are not received by the first transceiver.

11. A repeater according to claim 9, wherein the reverse-main-signals and the  
2 reverse-diversity-signals are generated from a reverse-signal transmitted from the second transceiver.

12. A repeater according to claim 9, wherein the second repeater unit comprises a  
2 first antenna which receives the reverse-main-signals and a second antenna which receives the reverse-diversity-signals.

13. A repeater according to claim 12, wherein the first and second antennas are  
2 separated by a distance within a range of 1 - 6 wavelengths of the reverse-main-signals and the reverse-diversity-signals.

14. A repeater according to claim 12, wherein the first and second antennas are  
2 adapted to receive differently polarized signals.

15. A repeater according to claim 9, wherein at least one of the first and the  
2 second repeater units is adapted to introduce a time differential between the reverse-main-signals and the reverse-diversity-signals.

16. A repeater according to claim 9, wherein the cabling comprises a first cable  
2 which conveys the amplified-forward-signals and the amplified-reverse-main-signals, and a second cable which conveys the amplified-reverse-diversity-signals.

17. A repeater according to claim 9, wherein the first repeater unit comprises a  
2 power supply which supplies power to the first repeater unit and to the second repeater unit via the cabling.

18. A repeater according to claim 9, wherein the first repeater unit comprises a  
2 monitor which monitors a condition of the first repeater unit and of the second  
repeater unit via the cabling.

19. A repeater according to claim 9, wherein the first repeater unit comprises a  
2 first forward-signal-converter adapted to generate the amplified-forward-signals as  
converted-frequency-forward-signals, and the second repeater unit comprises a  
4 second forward-signal-converter adapted to generate the resultant-forward-signals  
from the converted-frequency-forward-signals.

20. A repeater according to claim 19, wherein the first forward-signal-converter  
2 comprises a first mixer which receives an indication of a local oscillator (LO)  
frequency and generates the converted-frequency-forward-signals as intermediate-  
4 frequency-forward-signals (IF-forward-signals) having a frequency less than the  
forward-signals responsive to the indication, and wherein the second forward-signal-  
6 converter comprises a second mixer which receives the indication of the LO  
frequency and the IF-forward-signals and generates the resultant-forward-signals  
8 responsive thereto.

21. A repeater according to claim 19, wherein the first forward-signal-converter  
2 comprises an optical emitter which generates a modulated-optical-carrier responsive  
to the forward-signals, the second forward-signal-converter comprises an optical  
4 detector which receives the modulated-optical-carrier and generates the resultant-  
forward-signals therefrom, and wherein the cabling comprises a fiber optic cable.

22. A repeater according to claim 9, wherein the second repeater unit comprises:  
2 a first reverse-signal-converter adapted to generate the amplified-reverse-  
main-signals as converted-frequency-reverse-main-signals; and  
4 a second reverse-signal-converter adapted to generate the amplified-reverse-  
diversity-signals as converted-frequency-reverse-diversity-signals,

6 and wherein the first repeater unit comprises:  
a third reverse-signal-converter adapted to generate the resultant-reverse-  
8 main-signals from the converted-frequency-reverse-main-signals; and  
a fourth reverse-signal-converter adapted to generate the resultant-reverse-  
10 diversity-signals from the converted-frequency-reverse-diversity-signals.

23. A repeater according to claim 22, wherein the converted-frequency-reverse-  
2 diversity-signals comprise a different frequency from the converted-frequency-  
reverse-main-signals.

24. A repeater according to claim 22, wherein the first reverse-signal-converter  
2 comprises a first mixer which receives an indication of a first local oscillator (LO)  
frequency and generates the converted-frequency-reverse-main-signals as  
4 intermediate-frequency-reverse-main-signals (IF-reverse-main-signals) having a  
frequency less than the reverse-main-signals responsive thereto, and wherein the third  
6 reverse-signal-converter comprises a second mixer which receives the indication of  
the first LO frequency and the IF-reverse-main-signals and generates the resultant-  
8 reverse-main-signals responsive thereto.

25. A repeater according to claim 24, wherein the second reverse-signal-converter  
2 comprises a third mixer which receives an indication of a second LO frequency and  
generates the converted-frequency-reverse-diversity-signals as intermediate-  
4 frequency-reverse-diversity-signals (IF-reverse-diversity-signals) having a frequency  
less than the reverse-diversity-signals responsive thereto, and wherein the fourth  
6 reverse-signal-converter comprises a fourth mixer which receives the indication of the  
second LO frequency and the IF-reverse-diversity-signals and generates the resultant-  
8 reverse-diversity-signals responsive thereto.

26. A repeater according to claim 25, wherein the second LO frequency and the  
2 first LO frequency are different.

27. A repeater according to claim 22, wherein the first reverse-signal-converter  
comprises a first optical emitter which generates a first modulated-optical-carrier  
responsive to the reverse-main-signals, and wherein the third reverse-signal-converter  
comprises a first optical detector which receives the first modulated-optical-carrier  
and generates the resultant-reverse-main-signals therefrom, and wherein the cabling  
comprises a fiber optic cable.

28. A repeater according to claim 27, wherein the second reverse-signal-converter  
comprises a second optical emitter which generates a second modulated-optical-  
carrier responsive to the reverse-diversity-signals, and wherein the fourth reverse-  
signal-converter comprises a second optical detector which receives the second  
modulated-optical-carrier and generates the resultant-reverse-diversity-signals  
therefrom.

29. A repeater according to claim 28, wherein the second modulated-optical-  
carrier comprises a second modulated-optical-carrier frequency different in value  
from a first modulated-optical-carrier frequency of the first modulated-optical-carrier.

30. A method for repeating radio-frequency (RF) signals, comprising:  
receiving in a first repeating section forward-signals from a first transceiver;  
amplifying the forward-signals in the first repeating section so as to generate  
amplified-forward-signals;  
radiating the amplified-forward-signals from the first repeating section to a  
second transceiver;  
receiving in the first repeating section reverse-main-signals from the second  
transceiver;  
amplifying the reverse-main-signals in the first repeating section so as to  
generate amplified-reverse-main-signals;  
transmitting the amplified-reverse-main-signals from the first repeating  
section to the first transceiver;

receiving in a second repeating section reverse-diversity-signals from the  
14 second transceiver;

amplifying the reverse-diversity-signals in the second repeating section so as  
16 to generate amplified-reverse-diversity-signals; and

transmitting the amplified-reverse-diversity-signals from the second repeating  
18 section to the first transceiver.

31. A method according to claim 30, and comprising enclosing the first and the  
2 second repeating sections in a common housing.

32. A method according to claim 30, wherein the forward-signals are not received  
2 by the second transceiver, and the reverse-main-signals and the reverse-diversity-  
signals are not received by the first transceiver.

33. A method according to claim 30, and comprising transmitting a reverse-signal  
2 from the second transceiver and wherein receiving in the first repeating section the  
reverse-main-signals comprises generating the reverse-main-signals responsive to the  
4 reverse-signal, and wherein receiving in the second repeating section the reverse-  
diversity-signals comprises generating the reverse-diversity-signals responsive to the  
6 reverse-signal.

34. A method according to claim 30, and comprising receiving the reverse-main-  
2 signals in a first antenna comprised in the first repeating section, and receiving the  
reverse-diversity-signals in a second antenna comprised in the second repeating  
4 section.

35. A method according to claim 34, wherein the first and second antennas are  
2 separated by a distance within a range of 1 - 6 wavelengths of the reverse-main-  
signals and the reverse-diversity-signals.

36. A method according to claim 34, wherein the first and second antennas are  
2 adapted to receive differently polarized signals.

37. A method according to claim 30, and comprising introducing a time delay  
2 between the reverse-main-signals and the reverse-diversity-signals.

38. A method for repeating radio-frequency (RF) signals, comprising:  
2 receiving forward-signals from a first transceiver;  
amplifying the forward-signals in a first repeater unit so as to generate  
4 amplified-forward-signals;  
conveying the amplified-forward-signals to a second repeater unit;  
6 further amplifying the amplified-forward-signals in the second repeater unit so  
as to generate resultant-forward-signals;  
8 radiating the resultant-forward-signals to a second transceiver;  
receiving reverse-main-signals and reverse-diversity-signals from the second  
10 transceiver;  
amplifying the reverse-main-signals and the reverse-diversity-signals in the  
12 second repeater unit so as to generate respectively amplified-reverse-main-signals and  
amplified-reverse-diversity-signals;  
14 conveying the amplified-reverse-main-signals and the amplified-reverse-  
diversity-signals to the first repeater unit;  
16 further amplifying the amplified-reverse-main-signals and amplified-reverse-  
diversity-signals in the first repeater unit so as to generate respectively resultant-  
18 reverse-main-signals and resultant-reverse-diversity-signals; and  
transmitting the resultant-reverse-main-signals and the resultant-reverse-  
20 diversity-signals to the first transceiver.

39. A method according to claim 38, wherein conveying the amplified-forward-  
2 signals comprises conveying the amplified-forward-signals via cabling.



40. A method according to claim 38, wherein the forward-signals are not received  
2 by the second transceiver, and the reverse-main-signals and the reverse-diversity-  
signals are not received by the first transceiver.

41. A method according to claim 38, wherein receiving the reverse-main-signals  
2 and the reverse-diversity-signals from the second transceiver comprises transmitting a  
reverse-signal from the second transceiver and generating the reverse-main-signals  
4 and the reverse-diversity-signals responsive to the reverse-signal.

42. A method according to claim 38, wherein receiving the reverse-main-signals  
2 and the reverse-diversity-signals comprises receiving the reverse-main-signals in a  
first antenna and receiving the reverse-diversity-signals in a second antenna.

43. A method according to claim 42, wherein the first and second antennas are  
2 separated by a distance within a range of 1 - 6 wavelengths of the reverse-main-  
signals and the reverse-diversity-signals.

44. A method according to claim 42, wherein the first and second antennas are  
2 adapted to receive differently polarized signals.

45. A method according to claim 38, and comprising introducing a time delay  
2 between the reverse-main-signals and the reverse-diversity-signals.

46. A method according to claim 38, wherein conveying the amplified-forward-  
2 signals comprises conveying the amplified-forward-signals via a first cable, and  
wherein receiving the reverse-main-signals and the reverse-diversity-signals  
4 comprises conveying the reverse-main-signals via the first cable and conveying the  
reverse-diversity-signals via a second cable.

47. A method according to claim 38, wherein amplifying the forward-signals comprises converting a frequency of the forward-signals to generate the amplified-forward-signals as converted-frequency-forward-signals, and wherein further amplifying the amplified-forward-signals comprises generating the resultant-forward-signals from the converted-frequency-forward-signals.

48. A method according to claim 47, wherein converting the frequency of the forward-signals comprises mixing the forward-signals in a first mixer with a local oscillator (LO) frequency and generating the converted-frequency-forward-signals as intermediate-frequency-forward-signals (IF-forward-signals) having a frequency less than the forward-signals, and wherein further amplifying the amplified-forward-signals comprises mixing the IF-forward-signals with the LO frequency and the IF-forward-signals in a second mixer and generating the resultant-forward-signals therefrom.

49. A method according to claim 47, wherein converting the frequency of the forward-signals comprises modulating an optical carrier to generate a modulated-optical-carrier responsive to the forward-signals, and conveying the modulated-optical-carrier from the first repeater unit to the second repeater unit via a fiber optic cable, and generating the resultant-forward-signals comprises detecting the modulated-optical-carrier.

50. A method according to claim 38, and comprising:  
generating in a first reverse-signal-converter comprised in the second repeater unit the amplified-reverse-main-signals as converted-frequency-reverse-main-signals;  
generating in a second reverse-signal-converter comprised in the second repeater unit the amplified-reverse-diversity-signals as converted-frequency-reverse-diversity-signals;  
generating in a third reverse-signal-converter comprised in the first repeater unit the resultant-reverse-main-signals from the converted-frequency-reverse-main-

signals; and

- 10 generating in a fourth reverse-signal-converter comprised in the first repeater  
unit the resultant-reverse-diversity-signals from the converted-frequency-reverse-  
12 diversity-signals.

51. A method according to claim 50, wherein the converted-frequency-reverse-  
2 diversity-signals comprise a different frequency from the converted-frequency-  
reverse-main-signals.

52. A method according to claim 50, wherein generating in the first reverse-  
2 signal-converter comprises mixing a first local oscillator (LO) frequency with the  
reverse-main-signals so as to generate the converted-frequency-reverse-main-signals  
4 as intermediate-frequency-reverse-main-signals (IF-reverse-main-signals) having a  
frequency less than the reverse-main-signals, and generating in the third reverse-  
6 signal-converter comprises mixing the first LO frequency and the IF-reverse-main-  
signals so as to generate the resultant-reverse-main-signals therefrom.

53. A method according to claim 52, wherein generating in the second reverse-  
2 signal-converter comprises mixing a second LO frequency different from the first LO  
frequency with the reverse-diversity-signals so as to generate the converted-  
4 frequency-reverse-diversity-signals as intermediate-frequency-reverse-diversity-  
signals (IF-reverse-diversity-signals) having a frequency less than the reverse-  
6 diversity-signals, and wherein generating in the fourth reverse-signal-converter  
comprises mixing the second LO frequency and the IF-reverse-diversity-signals so as  
8 to generate the resultant-reverse-diversity-signals therefrom.

54. A method according to claim 50, wherein generating in the first reverse-  
2 signal-converter comprises modulating a first optical emitter with the reverse-main-  
signals so as to produce a first modulated-optical-carrier and conveying the first  
4 modulated-optical-carrier from the second repeater unit to the first repeater unit via a

fiber optic cable, and wherein generating in the third reverse-signal-converter  
comprises detecting the first modulated-optical-carrier and generating the resultant-  
reverse-main-signals therefrom.

55. A method according to claim 54, wherein generating in the second reverse-  
signal-converter comprises modulating a second optical emitter with the reverse-  
diversity-signals so as to produce a second modulated-optical-carrier, and conveying  
the first modulated-optical-carrier from the second repeater unit to the first repeater  
unit via the fiber optic cable, and wherein generating in the fourth reverse-signal-  
converter comprises detecting in a second optical detector the second modulated-  
optical-carrier and generating the resultant-reverse-diversity-signals therefrom.

56. A radio-frequency (RF) repeater system, comprising:  
a first repeater unit, which is adapted to receive and amplify forward-signals  
from a first transceiver so as to generate amplified-forward-signals;  
cabling, which is adapted to receive and convey the amplified-forward-signals  
from the first repeater unit; and  
a plurality of second repeater units, each of which is adapted to receive the  
amplified-forward-signals from the cabling and to further amplify the amplified-  
forward-signals so as to generate resultant-forward-signals and to radiate the  
resultant-forward-signals to a second transceiver, and which is adapted to receive and  
amplify reverse-main-signals and reverse-diversity-signals from the second  
transceiver so as to generate respectively amplified-reverse-main-signals and  
amplified-reverse-diversity-signals and to convey the amplified-reverse-main-signals  
and the amplified-reverse-diversity-signals to the first repeater unit via the cabling,  
and wherein the first repeater unit is adapted to further amplify the amplified-reverse-  
main-signals and amplified-reverse-diversity-signals so as to generate respective  
resultant-reverse-main-signals and resultant-reverse-diversity-signals and to transmit  
the resultant-reverse-main-signals and the resultant-reverse-diversity-signals to the  
first transceiver.



57. A method for repeating radio-frequency (RF) signals, comprising:

2 receiving forward-signals from a first transceiver;

amplifying the forward-signals in a first repeater unit so as to generate

4 amplified-forward-signals;

conveying the amplified-forward-signals to a plurality of second repeater

6 units;

further amplifying the amplified-forward-signals in the plurality of second

8 repeater units so as to generate resultant-forward-signals;

radiating the resultant-forward-signals to a second transceiver;

10 receiving reverse-main-signals and reverse-diversity-signals from the second transceiver;

12 amplifying the reverse-main-signals and the reverse-diversity-signals in the plurality of second repeater units so as to generate respectively amplified-reverse-main-signals and amplified-reverse-diversity-signals;

14 conveying the amplified-reverse-main-signals and the amplified-reverse-diversity-signals to the first repeater unit;

16 further amplifying the amplified-reverse-main-signals and amplified-reverse-diversity-signals in the first repeater unit so as to generate respectively resultant-reverse-main-signals and resultant-reverse-diversity-signals; and

18 transmitting the resultant-reverse-main-signals and the resultant-reverse-diversity-signals to the first transceiver.

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58. A method according to claim 57, wherein conveying the amplified-forward-signals comprises conveying the amplified-forward-signals via cabling.

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